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REDISCOVERY OF *TRIFOLIUM STOLONIFERUM* IN MISSOURI

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The genus *Trifolium* is represented in Missouri by three native and several introduced species of clovers. Of the native species, *T. reflexum* L., buffalo clover, is the most common, with about 120 extant and historical populations documented from 53 counties (D. Butler, Missouri Natural Heritage Program, pers. comm.). A second species, *T. carolinianum* Michx., Carolina clover, was never very common in the state, and although it has been documented from two native, historical populations from southwestern Missouri, it is presently thought to be extirpated in Missouri. The third species, *T. stoloniferum* Muhl. ex Eaton, running buffalo clover, was also thought to be extirpated in the state until recently.

Historically, *T. stoloniferum* was evidently scattered and uncommon in Missouri. Steyermark (1963) and Brooks (1983) discussed its occurrence in four counties in the central and southern parts of the state, based upon herbarium specimens collected between 1830 and 1907. The majority of these collections originated from the St. Louis area (near Allenton and Eureka), where the plants may have been locally common.

Running buffalo clover apparently disappeared from the state at some point after the last collections were made around the turn of the century, possibly because of habitat loss, the disappearance of large herbivores such as bison, and competition from introduced clovers and other forbs (Campbell et al., 1988). This phenomenon occurred rangewide, and the species was considered extinct until the discovery of two small populations in West Virginia in 1983 (Cochrane et al.,

1994). It was listed as endangered under the Federal Endangered Species Act in 1987.

Searches by botanists have since resulted in the discovery of several indigenous populations in portions of the species' former range, which encompassed lands from eastern Kansas to West Virginia. Cochrane et al. (1994) summarized the 65 populations discovered between 1983 and 1993 in Indiana, Kentucky, Ohio, and West Virginia. However, searches in Arkansas, Illinois, Kansas, and Missouri during this same period were unsuccessful.

The Missouri Department of Conservation (MDC) conducted detailed searches of historic sites and nearby potential habitat during 1988, 1989, and 1994 (Thurman, 1989; Hickey, 1994). The widely publicized discovery in 1989 of six plants that had sprouted from seed in garden topsoil originating from the Meramec River basin in Jefferson County provided some hope that native populations might still exist in the state.

This proved fruitless, but propagules from these plants and stocks from other states were used by the Missouri Botanical Garden's (MBG) Center for Plant Conservation in a reintroduction program for the species in Missouri. This cooperative program between MBG and MDC began in 1991 and has resulted in the establishment of 98 small and carefully monitored populations at 27 sites in 15 counties in the southern half of the state (MDC, pers. comm.). A similar cooperative program exists with the U.S. Forest Service (USFS) and includes 14 present populations in the Mark Twain National Forest (USFS, pers. comm.). However, the introduced populations have responded with mixed success, and their longterm viability has not been demonstrated. Thus the discovery of naturally occurring plants continues to be a high priority.

On May 18, 1994, while completing field work as part of the Missouri Natural Features Inventory, the author and MDC biologist Greg Gremaud discovered a new site for naturally occurring *T. stoloniferum* in

Madison County. This population included 24 flowering stems and several additional vegetative shoots, and occurred in a habitat very similar to that in which extant populations in other states occur. Subsequent searches in the vicinity by MDC botanist Tim Smith on June 9, 1994, disclosed a second group of about 40 plants a short distance from the first site. Further searches within a 50 mile radius of the population later in the year failed to disclose additional plants. Detailed locality data are not presented here, but a voucher specimen, *Rowan and Gremaud 94-135* has been deposited at the Missouri Botanical Garden Herbarium.

The new Missouri station is on privately owned land and occurs along two forks of an old dirt road near a stream in a mesic, upland, oak forest that has been lightly to moderately grazed by cattle. The soil at the site is mapped as Skranka silt loam (proposed series), a fine, mixed, mesic, Typic Hapludalf found only in igneous, Precambrian areas of the Ozarks (K. Benham, Soil Conservation Service, pers. comm.). Two samples were sent to the University of Missouri Extension Service for testing, and were described as silty clay loam (pH 5.4) and loam (pH 5.2), respectively, both with relatively low phosphorous and medium to high potassium, calcium, and magnesium contents.

Grazing has undoubtedly had an impact on the population of running buffalo clover at this site. When first observed in May, the plants were flowering and appeared robust and ungrazed. Only a few of the plants were actively producing stolons at that time. By mid-July, no fertile stems or fruits were observed, and only scattered leaves and stipules remained on the grazed, prostrate stems. Anecdotal information supplied by the owner of the site and the cattle operator indicates that the site has been grazed for a period of at least 40 years. However, grazing intensity appears to have been uneven, with cattle on the site only from January or February until late summer, when the local oak trees begin to produce green acorns. Thus, the area is allowed to

recover annually for a period of up to five months. Presumably, the plants continue to spread vegetatively during the later part of the growing season, but this potential for regrowth has not been examined. A small amount of viable seed was produced during 1994, in spite of the grazing.

Several aspects of the station in Madison County require further study. Although the plants are presumed to represent an old native population, the possiblity that plants were introduced from populations outside the state more recently by the shipment of cattle remains a slight possibility. Little is known of the genetic variation of plants at the site or how these plants may be related genetically to other populations elsewhere. The role of seasonal grazing in the maintenance of the local habitat in its present condition is not presently understood, and whether cattle grazing has had more beneficial or more harmful effects on the plants growing in the open oak forest there is not known. Finally, the discovery of a new population of running buffalo clover at some distance from historically known sites raises the question of where future efforts to discover additional sites would most profitably be conducted.

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ANNOUNCEMENT

Copies of plant lists and other information relating to the flora are requested for inclusion in the Society's flora file. Please send items to the archivist, Jim Bogler (see address on inside front cover).

NOTES ON *OPHIOGLOSSUM* IN MISSOURI

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The small plants known as adder's tongues are members of the genus *Ophioglossum* (Ophioglossaceae), which also includes the somewhat larger grape ferns and rattlesnake ferns of the genus *Botrychium*. During the past few years I have developed an interest in the adder's tongue ferns of Missouri, which are more diverse than was reported in Steyermark's (1963) Flora of Missouri.

Ophioglossum engelmannii Prantl and *O. vulgatum* L. have both been known in the state for many years and have been rather widely collected. These are the only two adder's tongues included in Steyermark (1963) and the only two listed in my now well-worn seventh edition of Gray's New Manual of Botany (1908). The limestone adder's tongue, *O. engelmannii*, is often found in dense colonies, a growth habit that makes it more visible in the field, and is probably the best known species of this group. Its preferred habitat of thin soil over limestone or dolomite outcrops also makes it fairly easy to locate. It has been found in a few counties north of the Missouri River and in most of the counties south of the river, except for the lowland counties of the Bootheel. It should eventually be located in every county south of the Missouri River. I found this fern in Butler and Wayne Counties in 1993, and in fact had just finished making the Wayne County collection when I realized that the six foot long "log" lying across my path was actually a rattlesnake.

Ophioglossum vulgatum is widely distributed in the U.S. and Canada (as well as in Eurasia and Mexico) and was separated into several varieties by most authors for the last several decades. In the U.S., these varieties were var. *pycnostichum* Fernald, the southern adder's tongue, and var. *pseudopodum* (Blake) Farw., the northern

adder's tongue. Both varieties are listed for Missouri in Steyermark's Flora and in the Catalogue of the Flora of Missouri by Yatskievych and Turner (1990). However, Steyermark listed the southern adder's tongue as occurring only in two counties *north* of the Missouri River and the northern adder's tongue in a few counties *south* of the river, exactly the opposite that one would expect. More recent collections of these adder's tongues have been made from some of the intervening counties, but until recently this situation remained confusing.

The recently published Volume 2 on ferns and fern allies in the Flora of North America series (Flora of North America Editorial Committee, 1993) presents a different view of things. In it the northern and southern adder's tongue ferns are treated as two different species, *O. pusillum* Raf. and *O. vulgatum* L. (in the strict sense), respectively. The northern *O. pusillum* is stated to occur nearly throughout the northern U.S. and adjacent Canada southward to about the boundary of Wisconsin glaciation. Although it is shown to occur nearly throughout Iowa, Missouri is excluded from its range. In contrast, the southern *O. vulgatum*, which is widespread in the southern and northeastern U.S., is shown to occupy the entire range in Missouri that Steyermark (1963) attributed to both of his varieties. Redetermination of the available herbarium specimens by George Yatskievych (Flora of Missouri Project, personal communication) has confirmed that all of the Missouri collections are indeed the southern adder's tongue, and that the northern adder's tongue is not known to grow in Missouri.

In 1974, R. Dale Thomas, Paul S. Marx, and David Lawson, three botanists from Louisiana, reported two additional species of *Ophioglossum* for Missouri (Thomas et al., 1974). Doctor Thomas has found numerous new sites for various species of adder's tongues in the southeastern U.S. during the past few decades, particularly in cemeteries. The stalked adder's tongue, *O. petiolatum* Hook., was found at a single site on a

church lot in Pemiscot County, and the bulbous adder's tongue, *O. crotalophoroides* Walt. was discovered in an Oregon County cemetery. No further sitings of these two species have been made since the original discoveries. Obviously, we need more.

Both of these species, as well as the other adder's tongues, are nicely depicted and described in James Key's (1982) Field Guide to Missouri Ferns. The illustrations show mature, spore-bearing plants. However, these species may be quite difficult to locate in the field at this stage, possibly because they become overgrown by other vegetation.

Recent field work by several botanists in Arkansas has yielded numerous new collections and a lot of information about these plants. Apparently, new growth first emerges in the late fall, developing at a pace dependent upon weather conditions, and the plants can be identified during the late fall and winter by those who know where to look and what to look for. In cemeteries that are well-maintained and kept mowed into the fall, areas with scanty vegetation are perhaps the best places to look. Places with dense lawns should be avoided. What to look for are plants that resemble recently sprouted crab grass—the same shade of green, much the same leaf shape, and about 2-3 cm long. Of course, there is no crab grass sprouting in the wintertime, and closer examination will confirm whether you have indeed found an adder's tongue. A friend of mine from Arkansas, Don Crank, reports finding *O. petiolatum*, *O. crotalophoroides*, *O. engelmannii*, and *O. nudicaule*, all on November 3, 1994.

If you do find some adder's tongues, good color photographs of the plants in their natural habitats would be useful to show others what the plants look like. An intact root system is necessary to provide certain identification of the plants.

It is possible that the Pemiscot County collection for *O. petiolatum* represents a disjunct population, as Smith's (1988) Atlas and Annotated List of the Vascular

Plants of Arkansas lists White County (about four counties from the Missouri state line) as the closest occurrence, but it is more probable that the plant has been overlooked and undercollected in northeastern Arkansas. *Ophioglossum crotalophoroides* has been found quite widely in Arkansas, and Smith's (1988) Atlas includes a dot for Randolph County, which is adjacent to southeastern Missouri. I think it very likely that this adder's tongue may be found in several counties in southern Missouri following more detailed searches.

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WHY "ADDER'S TONGUE"?

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Three of our native plant taxa have borne the name "adder's tongue" in one way or another: the fern genus *Ophioglossum* L., the orchid *Pogonia ophioglossoides* (L.) Ker Gawler, and the genus in the lily family *Erythronium*. In his 1692 catalogue of the plants of Virginia (unpublished until included in Ewan and Ewan, 1970), John Banister makes it clear that the orchid merely resembles the ferns with respect to its leaf shape, and in his treatment of the lilies he makes no reference to an adder's tongue. It would seem, therefore, that the earliest application of this common name was to the ferns. The epithet *Ophioglossum* is a compound of two Greek words, ὀφιο (ophio-), meaning snakelike, and γλωσσα (glossa), meaning tongue (Fernald, 1950; Stearn, 1983).

As all snakes have forked tongues (adders are no exception), it appears that none of the three plant taxa bears any structural resemblance to an adder's tongue. The name, however, was probably first used in reference to the sporophores of the ferns. These are slender, green, fertile portions of the leaves with slightly attenuated tips whose surfaces can be thought of as having a reptilian scaliness. By contrast, the vegetative segments of the these ferns' leaves, which are known as trophophores, appear as expanded, green blades that are ovate to lanceolate, entire and not at all dissected. Each fertile leaf consists of a sporophore and a trophophore, although the two are so different morphologically that they do not appear to represent parts of a single leaf. The trophophores are the most noticeable feature of the ferns for three reasons: 1) They mature before the sporophores do in the spring; 2) they are much easier to see from a distance; 3) only a limited number of plants

produce sporophores in a given season. The Missouri species of *Ophioglossum* typically occur in clusters or colonies with several to many trophophores evident in a relatively small area.

As to the orchid, John Banister called it *Helleborine Ophioglossi folio.* James Petiver's (1707) indelicate version was "Virginia bastard hellebore, with an adder's-tongue leaf." The currently accepted epithet for the *Pogonia* species, *ophioglossoides*, means "like the *Ophioglossum* (fern)" (Fernald, 1950). Thus, the single prominent leaf of the orchid is seen to resemble the leaf of the fern. The more commonly used name "snake mouth orchid" seems to have come later.

Species of the genus *Erythronium* also have been referred to as "adder's tongues." The leaves are probably the reason here, too. Our commoner species occur in extensive colonies, with most of the plants sterile in a given season, each of these producing only a single, basal leaf, not to unlike an *Ophioglossum* leaf. The similarity of their leafy beds at a casual glance has led to the lilies also being called "adder's tongues" on frequent occasion. Even when the lily flowers are present, the name is still applied, as in "yellow adder's tongue" for *E. americanum* Ker Gawler.

In a recently published book of plant lore, Timothy Coffey (1993) guesses that the "adder's tongue" of the lilies has something to do with their spotted leaves or protruding stamens. I think that the name can be explained as above, without searching these plants for herpetological features.

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THREE NEW PLANTS FOR SOUTHEASTERN MISSOURI

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The flora of southeastern Missouri is of particular interest, because parts of the region have been poorly botanized while at the same time a great deal of natural vegetation has been lost to levees, gravel and sand mines, and agriculture. The recent changes impacting the landscape of the Bootheel counties also provide extensive habitats for colonization by opportunistic species, particularly those commonly found as weeds in and around rice and cotton fields. The present report documents three new additions to the flora of southeastern Missouri.

AESCHYNOMENE RUDIS

In the early winter of 1991 a small group of tall plants was noted growing in a ditch along a rice field in Butler County. These were originally (mis)identified as *Aeschynomene virginica* (L.) Britton, Sterns, & Poggenb., also known as curly indigo and northern joint vetch, using weed control leaflets issued by the Agricultural Extension Service for Arkansas and Missouri (cf. Hurst et al., 1973). *Aeschynomene virginica* was not listed by Yatskievych and Turner (1990) and has not been documented from Missouri, but had been reported informally as a weed in Missouri rice fields as early as 1987 in Extension Service news releases.

Further field work resulted in the discovery of additional sites, and yielded specimens that were taken to the Missouri Botanical Garden (MO) for verification. Comparison of these specimens with material at MO did not confirm the initial determination as *A. virginica*.

Instead, they were shown to belong to a related species, *A. rudis* Benth., a new state record. These collections were subsequently verified by Dr. Velva Rudd, who is studying the genus for the Flora of North America Project and who monographed the American species (Rudd, 1955). Previous reports of *A. virginica* from the South-Central States, including Arkansas, are all referrable to *A. rudis* (Smith, 1988; Isely, 1990).

Voucher Specimens: Butler County; along County Road 236, T22N R7E S22/23 S margin and S26/27 N margin, 28 Aug 1993, *Hudson 194* (MO); N side of State Highway 142 at junction with County Road 341, ca. 4 mi E of U.S. Highway 67 junction (in Neelyville), T22N R06E S8 SW4, 6 Sep 1993, *Yatskievych, McKenzie, & Hudson 93-348* (MO); same locality, 30 Sep 1993, *Hudson 317* (MO).

Aeschynomene rudis is a coarse, annual, papilionoid legume (Fabaceae) to 2 m tall or more. The upper portions of the stem are covered with long-stalked, pustular glands with globose heads that are visible without a hand lens. The leaves are pinnately compound with 20-40 leaflets. The flowers have yellow to pinkish petals 10-13 mm long. The fruits are cigar-shaped, 3-5 cm long, and split into 1-seeded, nearly square segments. This species differs from *A. indica* L., the Indian jointvetch (to which it would key in Steyermark's (1963) Flora), by its larger flowers and dense glandularity. The fruits of *A. virginica* have longer stalks than do those of either *A. indica* or *A. rudis*. A unique feature of *A. rudis* is that the fruits are muricate on the sides, with rows of wartlike projections on the fruit walls.

This species grows on banks of ditches along rice fields and roads and in other wet, disturbed habitats. Presently known populations are widely scattered over about 50 square km (20 square mi) in Butler County. The closest populations in Arkansas occur in Clay and Randolph Counties, immediately to the south (Smith, 1988). The species is native to South America, and was presumably introduced into the United States prior to 1856 (Carulli et al., 1988). It occurs mostly on the

Coastal Plain, and disjunct populations have been reported historically from Pennsylvania (Carulli et al., 1988). Because this species is susceptible to treatment with "Collego" (a spray of fungal spores of *Colletotrichum* developed by researchers at the University of Arkansas as a biological control to eradicate joint vetches), it is not as serious a weed problem as the resistant *A. indica.*

ERIANTHUS GIGANTEUS

Erianthus, or plume grass, contains about 25 species, including both New and Old World natives. Steyermark (1963) and Yatskievych and Turner (1990) included three species for Missouri, the introduced ravenna grass, *E. ravennae* (L.) P. Beauv., the native silver plume grass, *E. alopecuroides* (L.) Elliott, and the native narrow plume grass, *E. strictus* Baldwin. Recently a fourth species was discovered when *E. giganteus* (Walt.) Muhl. was found at the edge of a large creek valley in the northwest quarter of Butler County.

> **Voucher collections:** Butler County; N side of Butler County Road 428 ca. 1 mi from County Road 426 junction in valley of Ten Mile Creek, T25N R4E S14 center of Section, 9 October 1993, *Hudson 331* (MO); same locality, 15 Oct 1993, *Hudson 353* (MO).

Sterile plants of *E. giganteus* form large clumps to nearly 1 m tall. The leaves were not grazed by cattle foraging in the area, presumably because they are too tough to be palatable. The flowering stems reach to about 3 m tall and are tipped with large, gray-purple, plumelike panicles. Distinguishing features of this species are the appressed-hairy stems with bearded nodes, the long, silky hairs at the base of each spikelet, and the nearly straight awns that are not flattened.

The habitat at the Missouri site consists of moist, pastured areas with localized seeps at the base of the slopes framing the valley. Two large stands of the grass are separated by colonies of cattail, *Typha* and a small

thicket of alder, *Alnus*. The surrounding areas will be searched for other potentially interesting plant species during 1994.

Erianthus giganteus is commonly known as giant plume grass or sugar cane plume grass. It is referred to as *E. saccharoides* in some older floristic manuals. The species is native to the southeastern United States, with the closest previously known populations occurring in Greene County, Arkansas, ca. 70 km to the south. There remains some question as to whether the Missouri population should be considered native. Although it is not far removed from the closest known Arkansas populations, the habitat in Missouri is fairly disturbed. It does not seem to have been intentionally introduced, but probably spread into the area relatively recently. The extensive size of the population argues for its having been at this site for a number of years..

EUPATORIUM ROTUNDIFOLIUM VAR. *SCABRIDUM*

Several species in the genus *Eupatorium* (Asteraceae) seem to favor disturbed, sandy to gravelly right-of-ways along roads and highways in the southeastern United States. For example, although Steyermark (1963) reported *E. hyssopifolium* L. as restricted to the margins of a sinkhole pond in Howell County, it has become quite common in recent years along roadsides in several counties in southeastern Missouri.

Last year, while surveying populations of *E. hyssopifolium* in Butler and Ripley Counties, an unusual *Eupatorium* was found. Comparison of these plants with collections at the Missouri Botanical Garden confirmed it to be a new state record, *Eupatorium rotundifolium* L. var. *scabridum* (Ell.) A. Gray. This native of the southeastern U.S. has previously been reported as far north as Craighead County, Arkansas (Smith, 1988), about 80 km to the south.

Voucher Specimens: Ripley County: along U.S. Highway 160 just east of Pilgrims Rest Church west of Fairdealing, T23N R04E S10 NW4, 11 Aug 1993, *Hudson 145* (MO); same locality, 18 Aug 1993, *Hudson 170* (MO); same locality, 6 Sep 1993, *Yatskievych, McKenzie, & Hudson 93-359* (MO); State Highway 142, a few yards W of field road to pond, T22N R04E S04 NE4, 12 Sep 1993, *Hudson & Hudson 266* (MO).

Eupatorium rotundifolium is similar to *E. hyssopifolium* in its relatively short stature. It is distinct from other Missouri thoroughworts in its sessile, opposite, broadly rounded leaves, which usually have 3 strong veins and can be fairly deeply incised. The several named varieties form a polyploid complex. Variety *scabridum* contains plants thought to have arisen through past hybridization between *E. rotundifolium* var. *rotundifolium* with *E. semiserratum* DC., and it is widespread in the southeastern United States westward to Oklahoma (Cronquist, 1980).

At the Highway 160 site, about 150 plants occur in a narrow band of mostly native prairie vegetation on a steep bank between the road and a mowed lawn. Several additional species of *Eupatorium* are present, including *E. altissimum* and *E. hyssopifolium*. The state-endangered narrow-leaved sunflower, *Helianthus angustifolius* L., also occurs as scattered plants. The species at this site are imperiled by mowing and spraying of herbicides along the highway. At the Highway 142 site, which is about 8 km to the south, only a single clump of four stems was found growing on a disturbed, grassy ditch bank. Additional searches along roadsides in the vicinity of both populations have failed to uncover additional populations.

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PASPALUM BIFIDUM (POACEAE), NEW TO MISSOURI, WITH MANAGEMENT RECOMMENDATIONS FOR ITS RECOVERY IN THE STATE

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Pitchfork paspalum [*Paspalum bifidum* (Bertol.) Nash] is known from southern Virginia to Florida and west to Texas. The range of the species extends inland to Arkansas, Oklahoma, and Tennessee (Chase, 1951; Gould, 1975; Godfrey and Wooten, 1979; Allen, 1992). Chase (1951) asserted that the species was "nowhere common" and Gould (1975) reported that pitchfork paspalum was "relatively infrequent" in Texas. The grass was listed as "rare" in Louisiana by Allen (1992) and "very rare" along the Coastal Plain of the southeastern United States by Radford et al. (1968). Although the habitat for *Paspalum bifidum* is primarily listed as open, sandy, pine, oak, or oak-pine woodlands (Chase, 1951; Radford et al., 1968; Gould, 1975; Allen, 1992), Godfrey and Wooten (1979) indicated that the species may be found, "in both seasonally wet and well-drained pinelands, also moist sands near seepage bogs, clearings of lowland woodlands, in mud of sloughs, and stream and pond margins."

HISTORY IN MISSOURI

During recent surveys for *Aristida lanosa* Muhl. ex. Ell. and *Cyperus grayoides* Mohlenbrock on Crowley's Ridge in southeastern Missouri, the author and Dr. Kelly Allred of New Mexico State University discovered nine plants of *Paspalum bifidum* along the slope of a sandy

Figure 1. Habit of *P. bifidum* at Holly Ridge Conservation Area.

woodland at Holly Ridge Conservation Area in Stoddard County on 9 Sep. 1992. The plants were sterile and growing in the shaded understory of an oak-hickory woodland with an approximate 90-95 percent crown closure. The plants appeared weak and spindly, apparently due to the shaded condition of the understory. The presence of prickly pear cactus [*Opuntia humifusa* (Raf.) Raf.] suggests that the area was formerly much more open. Because only nine plants could be located, only one plant was collected and donated to the Missouri Botanical Garden for propagation. Unfortunately, the specimen subsequently died following planting.

Rather than chance the removal of an additional specimen for propagation, a timber thinning was recommended in 1993 to open up the forest canopy and allow more light to reach the forest floor. In April 1994, foresters with the Missouri Department of Conservation (MDC) performed a timber thinning on the site as recommended. On 5 Sep. 1994, the author and Stephanie Smith of the Missouri Department of Natural Resources visited the site to assess the success of the previous spring's thinning. In an apparent response to the opening of the canopy, we noted that the colony of pitchfork paspalum contained 27 robust culms (Fig. 1) and five culms had emerging inflorescences with some spikelets in flower (Fig. 2). In addition to the response by *Paspalum bifidum*, we also noted 25-30 flowering specimens of the state-endangered sedge *Cyperus plukenetii* (L.) Torrey. These were scattered along the hillside where the thinning had been conducted. One specimen with an emerging inflorescence was taken as a voucher.

Voucher specimen: Stoddard County; Holly Ridge Conservation Area, ca. 4.8 km NE of Dexter, just E of Pleasant Valley Church; ca. 200-250 m up a small ridge, just N of a small house and barn; oak-hickory forest with sandy soil; T25N R11E S31 SE¼ of SE¼; elev. 134 m, 5 Sep 1994, *McKenzie & Smith 1520* (MO).

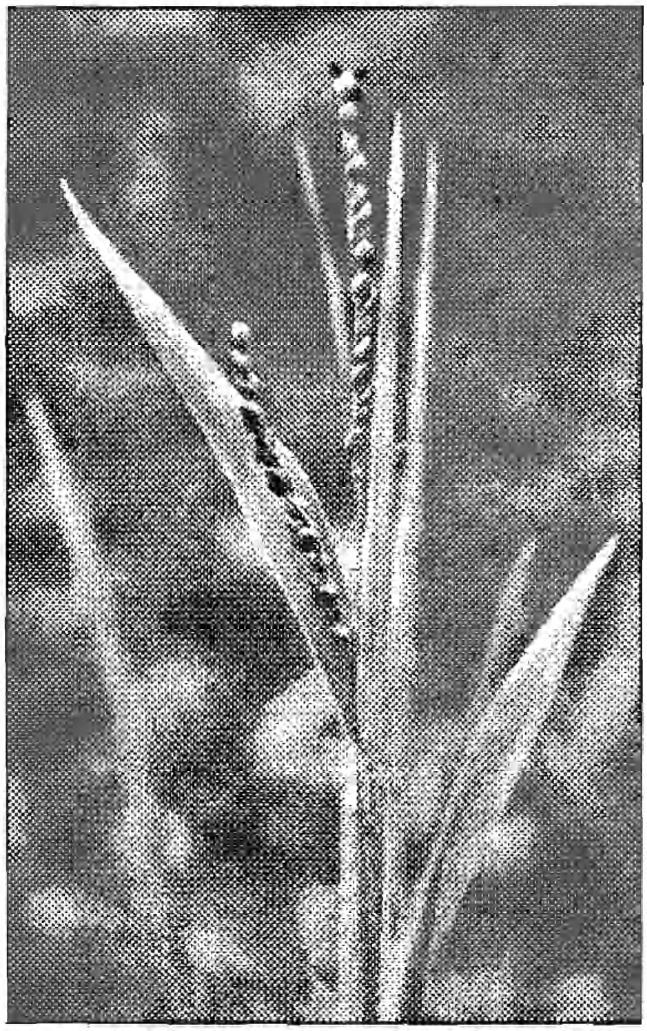

Figure 2. Emerging inflorescences and flowering spikelets of *P. bifidum* at Holly Ridge Conservation Area.

On 3 Aug. 1994, the author and MDC biologists Greg Gremaud and Doug Newman discovered a second site for *Paspalum bifidum* in Scott County. Three small colonies within ca. 30-50 meters of one another, and containing approximately 40, 20, and 50 culms, were located in the shaded understory of a sandy woodland along the edge of a thicket of *Smilax glauca* Walter. As at the initial discovery site, plants at the second location were in sterile, weak condition, apparently due to the closed canopy. A voucher specimen in sterile condition was collected. Additional living material was collected and donated to the Missouri Botanical Garden, where it is being propagated in the facility's green house in an attempt to stimulate the plants to flower.

Voucher specimen: Scott County; "Petite Isle" sand prairie, ca. 4.0 KM SE of the intersection of Rts. D and 77; T27N R14E S12 NE¼ of NE¼, 3 Aug 1994, *McKenzie, Gremaud & Newman 1480* (MO).

IDENTIFICATION AND PHENOLOGY

In sterile condition, *Paspalum bifidum* can be identified by the combination of long, tapering leaves that are conspicuously glaucous on the under surfaces, the usually pilose to pubescent sheaths, and the conspicuous scaly rhizomes that are lanate pubescent. The lanate-pubescent scales of the rhizomes are apparently unique to this species and are the one feature that allows for positive identification of this grass in sterile condition. Flowering specimens can be identified by the usually erect, 2-5 rames (mainly 3); paired spikelets that are remotely spaced on the axis such that they are either barely or non-overlapping; the occasional presence of a minute first glume; the 5-nerved second glume; and the usually 7-nerved sterile lemma. This species usually flowers late in the fall, often into late October and early November (Gould, 1975; Allen, 1992).

RECOMMENDATIONS FOR RECOVERY IN MISSOURI

At the two extant sites in Missouri, it is interesting to note that open areas occur within 80-100 m of both locations where *Paspalum bifidum* occurs. Why this species is absent from these open areas where light is suggestively more conducive for better plant growth and sexual reproduction is unknown. It is probable that the grass was historically much more widespread than is currently known. Perhaps colonies of this species located in more open areas disappeared during periods of severe drought, and the only specimens that persisted were those occurring in woodlands with a greater crown closure. The more extensive root systems in such areas might have provided a higher moisture content to herbaceous plants in the shaded understory. In time, however, the canopies of these sandy woodlands may have become so dense that specimens of *Paspalum bifidum* became stunted and were incapable of sexual reproduction. Nonetheless, the species was able to persist in a vegetative condition.

The sexually reproducing population on Holly Ridge CA should continue to be monitored. In January, 1995, Newman removed debris from an approximate 10 m radius around the plants at this site. The debris had been left following the April, 1994, thinning. A larger area should be cleared to enable the existing colony to expand. A scheduled controlled burn at the site within the next two years should keep the hillside open. In an attempt to increase the number of plants on the area, mature seeds produced from plants at the site should be planted in the fall of the year. As the current colony expands, consideration should be given to the possibility of dividing some of the clumps and planting them in the available opening northeast of the discovery site.

As at the first site, specimens of *Paspalum bifidum* at the Scott Co. locality would probably benefit from a timber thinning and controlled burning. Such manage-

ment, however, may not be acceptable to the current land owner. If so, it may be possible to negotiate one of the following options with the property owner: 1) some of the sterile plants could be moved to more open areas adjacent to the site, 2) specimens propagated at the Missouri Botanical Garden that successfully flower could be planted in the adjacent open areas, and 3) seeds produced through propagation efforts could be planted in appropriate habitat.

Paspalum bifidum should be considered as a candidate for state-endangered status following the guidelines established by the Missouri Department of Conservation (1992), and should be given a state ranking by the Nature Conservancy.

RELATIONSHIP TO OTHER SITES WHERE THE SPECIES OCCURS

Paspalum bifidum is usually found in sandy soil of various habitats (Chase, 1951; Gould, 1975). The two Missouri sites in Stoddard and Scott Counties are probably ecologically similar to the xeric, sandy conditions of the Post Oak Belt of east-central Texas (Bridges and Orzell, 1989). As indicated by Steyermark (1963), geological evidence suggests that Crowley's Ridge and the sand prairies of southeastern Missouri were probably situated east of the Mississippi River until recently. This is supported by the flora of these areas, many of which are more characteristic of the southeastern United States coastal plain. Bridges and Orzell (1989) compared the flora of "sandhill woodlands" in eastern Texas, "sandy longleaf pine savannahs" in eastern Texas and western Louisiana, and "dry, sandy prairies along the Illinois and Mississippi Rivers in central and northwest Illinois," and noted that these areas had the following species in common: *Aristida desmantha* Trin. & Rupr., *Cyperus grayoides* Mohlenbrock, *Cyperus lupulinus* (Spreng.) Marcks ssp. *lupulinus*, *Crotonopsis linearis* Michx., *Monarda punctata* L.,

Paspalum setaceum Michx., and *Stylisma pickeringii* (Torr.) A. Gray var. *pattersonii* (Fernald & B.G. Schubert). All of the above-mentioned species have been recently recorded in the sand prairies of southeastern Missouri (Carter and Bryson, 1991) and occur at least one of the currently known sites of *Paspalum bifidum* in Missouri (pers. obs. 1992-1994). During the recent discovery of *Cyperus grayoides* in the "pine sandhill" region of central Arkansas, Logan (1994) listed *Stylisma pickeringii* and *Monarda punctata* as associates. The commonality of such southeastern United States coastal plain relicts in these areas suggests that sandy woodlands along Crowley's Ridge and the sand prairies east of Crowley's Ridge were historically connected to areas farther south and east of Missouri. Steyermark (1963) summarized, "Some of the species found in the Southeastern Lowlands region reappear along the White River and its tributaries in the Ozarks, indicating a former connection geologically and floristically between the two regions."

It is likely that additional searches for this species in sandy woodlands along Crowley's Ridge and among the sand prairies in Scott, New Madrid, and Mississippi Counties will yield new locations of this grass in Missouri.

ACKNOWLEDGMENTS

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THREE PLANTS NEW TO MISSOURI

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Recent work has resulted in the discovery of three new introduced weeds in Missouri. Two of these are minor weeds that should never become problematical, and the third has the potential to infest disturbed woodlands in much of the state. Each is briefly discussed below.

LATHYRUS TUBEROSUS L. (FABACEAE), DUTCH MICE

This Eurasian vetch is a rhizomatous perennial with small tubers, giving rise to another common name, tuberous vetch. The plants have unwinged, two-angled stems, 2 leaflets per leaf, and small racemes of purple flowers. According to Bailey (1949), this species is cultivated in North America. Dutch Mice occurs sporadically as an introduced weed at scattered stations in the United States, mostly in the northern half of the country, from New England to Washington. It seems to be spreading in some areas of the Midwest, for example as evidenced in the differences between the reports in the two editions of Swink and Wilhelm (1978, 1994). Mabberley (1987) states that the tubers of this plant are edible and that a perfume was formerly distilled from the flowers.

In 1984 a small colony of Dutch Mice was discovered near the former site of an old farmstead at Bennett Spring State Park, in Laclede County. Here plants grew as scattered weeds in open areas and along an old, brushy fencerow. **Voucher collection:** *Ladd 9589*, 24 June 1984 (SMS).

This species would key out to the couplet containing *L. hirsutus* and *L. pusillus* in Steyermark (1963), after which the reader would be frustrated. *Lathyrus hirsutus* has small flowers up to 9 mm long and smooth, hairless

fruits, and *L. pusillus* has larger flowers and hairy fruits. *Lathyrus tuberosus* has flowers more than 10 mm long, and hairless fruits with a pattern of raised veins on the surface.

MENTZELIA NUDA (PURSH) TORREY & GRAY (LOASACEAE), SAND LILY

This large, attractive biennial or perennial is native in sandy and gravelly sites through much of the Great Plains from southeastern Montana south into northern Texas, extending eastward to central portions of Nebraska, Kansas, and Oklahoma. The attractive, creamy-white flowers are usually about 6-8 cm wide when fully open from late afternoon to sunset.

In September 1994 a large colony of Sand Lily was discovered in an extensive, sterile expanse of old lead mine tailings at St. Joe State Park in St. Francois County. Several hundred plants occurred as scattered individuals in open loose sand spoils. **Voucher collection:** *Ladd et al. 18353*, 17 September 1994 (MO).

There are now three species of *Mentzelia* known from Missouri. As Steyermark (1963) did not include a key, the following key can be used to distinguish the Missouri taxa:

1. Petals 5, orange; native plants of limestone glades and bluffs in western, central, and east-central Missouri; flowers opening in early morning . . *M. oligosperma*
1. Petals typically 10, creamy-white to pale yellow; uncommon introduced plants in disturbed sites; flowers opening in late afternoon or early evening
   2. Petals 15-40 mm long, creamy white; sepals 10-25 mm long; known from sandy mine spoils in eastern Missouri . . . . . *M. nuda*
   2. Petals 6-7 (10) mm long, pale yellow; sepals 3-6 mm long; known from well-drained, rocky waste areas . . . . . *M. albescens*

VIBURNUM OPULUS L. (CAPRIFOLIACEAE) EUROPEAN HIGHBUSH CRANBERRY

Also known as Guelder Rose, this Eurasian and North African shrub is widely planted as an ornamental, particularly in areas north of Missouri. In some areas, such as the Chicago Region (Swink and Wilhelm, 1994), the species has become naturalized in degraded wood-lands and thickets, spreading from bird-disseminated seeds.

In 1989, several plants of European Highbush Cranberry were discovered in a degraded upland woods in St. Charles County. This plant has the potential to become more widely distributed in the degraded woodlands that are common in the modern landscape, particularly around metropolitan and suburban areas. Other shrubs with similar ecological affinities include *Euonymus alatus*, *Lonicera maackii*, and *Rhamnus cathartica*. **Voucher collection:** *Ladd 13586*, 15 May 1989 (MO).

Unlike the other species of *Viburnum* in Steyermark (1963), European Highbush Cranberry has prominently lobed leaves, somewhat resembling maple leaves. Typically there are three main lobes, with the margins of the lobes shallowly to coarsely toothed.

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BOOK REVIEW

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Haller, Karen S. 1994. Walking With Wildflowers: A Field Guide to the St. Louis Area. University of Missouri Press, Columbia, MO. ix, 244 pp. $22.50 (paperbound). ISBN 0-8262-0950-5.

This book is a wildflower guide to areas within an hour's drive of St. Louis. Included are 28 public sites in St. Louis, Franklin, Jefferson, and St. Charles Counties, as well as St. Louis City. Seventy plant species are featured with photographs, blooming dates, and detailed plant descriptions. Each site has a map and specific directions, frequently to the nearest fraction of a yard, to the locations of the featured species. Additional sections include the featured species listed in order of blooming date, a checklist of 584 plant species growing at the 28 sites, and a glossary of botanical terms.

The photographs are excellent in clarity and are probably better than seeing the actual plant in the field in some cases. Descriptions and dimensions of various plant parts are detailed enough to permit easy identification of each of the featured species. The maps are very clear and when combined with the exact directions, allow anyone to find and recognize these plants. The author's style in locating each plant is reminiscent of Gregory Franzwa's Oregon Trail book series, where old monoments, graves, ruts, etc. are pinpointed in similar terms, such as, "18½ yards NE of grain silo." The author sprinkles the text with humorous tidbits, for example, describing how to control the spread of *Apios americana* in her yard by eating them, and by including *Botrychium dissectum* in the book even though it is a fern and not a wildflower, because, "I like it."

I have personally used Walking With Wildflowers to locate several plants, which were found precisely as described in the book. The comprehensive checklist of all the plants present at each of the sites is also a useful tool. The book is strongly bound and is of convenient size for a pocket field guide. Only one typographical error was found, a digit being omitted from the height of *Mertensia virginica.*

Karen Haller was awarded the Missouri Native Plant Society's "Erma R. Eisendrath Memorial Education Award" for this book in 1994. It is highly recommended for any wildflower enthusiast, and particularly for those interested in Missouri wildflowers.